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The Effects of Social Interaction Condition on Subjective Feelings and Oxytocin Levels

By

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Abstract

Conversations with those in our immediate environment mediate communication and facilitate the formation of new relationships. Studies have investigated the effects of different types of conversations on how close people feel to their conversation partners, and what variables influence the degree to which they form a social connection. The current study examined the impact of two conversation conditions: deep conversation and small talk, on feelings of closeness. Additionally, it investigated the effects of these conditions on oxytocin levels. Oxytocin is a hormone that is released during close social interactions. Thirty-seven healthy volunteers (18 females, 19 males) completed two sessions with two conversation conditions, each with a different same-sex partner: small talk and deep conversation. The primary outcome measures were feelings of connection with the partner after the conversation, and saliva samples for oxytocin assays. Participants also completed a follow-up session after both sessions were completed to provide their evaluations of their partners several days later. It was found that deep conversations led to higher feelings of closeness than small talk. However, the levels of oxytocin in salivary samples were below detectable limits leaving open the role of oxytocin in the psychological effects of the conversation.

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Introduction

Social interaction is an exchange of social information between two individuals. Previous research has shown that social interaction is essential for a healthy life and the overall well-being of individuals (Pearce et al., 2015), while lack of social interaction has been shown to negatively affect people's mental health (Umberson & Karas Montez, 2010). Thus, a healthy lifestyle requires an adequate amount of social interaction. Social communication is a type of social interaction that necessitates the use of language. In addition to its benefits on pleasant mood, social communication is vital for an individual's capacity to maintain healthy connections with others (Tinati et al., 2012). A conversation is a form of communication through speech that allows for the exchange of feelings and ideas ("APA Dictionary of Psychology," 2007). Conversations can be divided into two types: small talk and deep conversations. Both forms of conversation are essential and promote feelings of connectedness and enjoyment (Kardas et al., 2022). However, they are quite different in terms of content.

Deep conversations include the exchange of private and personal information among individuals. Such conversations discuss information not usually shared with a stranger but with someone close such as a close friend or a family member. Topics that could be included in a deep conversation include a most treasured memory, most significant accomplishment, and the last time someone cried. These subjects require people to share personal stories, memories, and ideas, thus requiring a high level of trust between people. There has been extensive research on deep conversation and its effects on social connection (Martino et al., 2015; Sprecher et al., 2013; Sprecher & Treger, 2015). For example, in one study, researchers found that participants felt less lonely and socially apprehensive following an event that taught deep conversational skills during the COVID-19 pandemic. Furthermore, the event reduced the individuals'

depression symptoms (Mote et al., 2021). In another study that explored how people underestimate others' interests in their feelings, it was found that participants felt more connected to each other in deep conversations than in shallow conversations (Kardas et al., 2022).

In contrast to deep conversation, small talk is a form of conversation that involves the exchange of shallow information among individuals. Shallow information includes that which is typically shared with strangers, not involving much personal disclosure. Examples of shallow topics that could be discussed in small talk include favorite holidays or favorite seasons. An example of this could be a conversation one has with someone they randomly sat next to in the park. Because such issues are impersonal, they allow for only a limited level of connection between people. In a study that explored the difference between small talk and intimate conversations between people, it was found that people felt closer during intimate conversations than they did during small talk (Kashdan et al., 2011). In addition, the same study found that small talk was less awkward than deep conversations. Based on these results, one may infer that people are more likely to initiate small talk because they feel less awkward starting such conversations.

Small talk and deep conversations elicit similar emotions, albeit small talk elicits them to a lesser degree. Deep conversations are reported to be more enjoyable and more meaningful than small talk. People usually depart from a deep conversation with overwhelming positive feelings (Kardas et al., 2022). Such feelings allow people to feel more comfortable sharing their ideas and deep thoughts. Therefore, one could infer that individuals partake in a deep conversation due to the positive emotions that linger following its termination. Similarly, small talk can elicit related sensations, although to a lesser extent, making small talk the less appealing of the two conditions (Kashdan et al., 2011). Additionally, deep conversations promote short-term well-being (Kardas

et al., 2022). This is another reason individuals prefer deep conversations rather than small talk, as they make individuals feel better both physically and mentally. Although small talk and deep conversations generate well-being and promote a social lifestyle, better overall well-being is correlated with engaging in deep and meaningful conversations (Mehl et al., 2010).

Neuropeptides play a role in social behaviors in general and conversations in particular. Such neuropeptides include endogenous oxytocin, which mediates the formation of social bonds from birth, especially between mothers and infants (Scatliffe et al., 2019). In addition, oxytocin allows for social bonding in adulthood (Hayashi & Strickland, 1998). However, there has not been extensive research on the method that allows for oxytocin to mediate social bonding through conversation.

Research in the field of the neurobiology of oxytocin initially focused on the role of oxytocin in social bonding between mothers and infants (Galbally et al., 2011). However, some more recent research has measured oxytocin levels in other forms of social interactions. For example, a study exploring the effects of story-telling on oxytocin levels in hospitalized children, discovered that their salivary oxytocin levels increased when children were read stories. (Brockington et al., 2021). This promotes the hypothesis that endogenous oxytocin increases from social interaction.

Another study found that engaging in gossip increased oxytocin levels. The level of gossip engagement was manipulated by comparing gossip conversations to conversations with no gossip (Brondino et al., 2017). This study could allow us to hypothesize that deep conversations lead to higher oxytocin levels. This is due to the fact that gossip and deep conversations usually occur between two individuals who know each other well. Further, since deep conversations allow for in-depth communication between individuals, trust is required, as it

is needed for gossip. This confirms the findings of another study that found that oxytocin could be linked to trust (Kosfeld et al., 2005).

Oxytocin administration positively affects empathy. A study that administered oxytocin to participants found that oxytocin increases one's ability to empathize with others (Procyshyn et al., 2020). Although this study did not measure endogenous oxytocin, one could infer from the findings of this study that empathy is related to oxytocin. During deep conversations, one may reveal intimate feelings. An example of this could be talking to a friend about the death of a loved one. Such conversations could lead to an increase in the empathy of the friend. Thus, one could hypothesize that deep conversation may lead to higher oxytocin levels when such conversations take place. However, a limitation of making such a hypothesis is that the oxytocin used in the Procyshyn et al. (2020) study was exogenously administered.

Although the conversation is one of the most common forms of social connection, little research has investigated the impact of deep versus shallow conversations on oxytocin levels. This means that it is unknown how oxytocin levels are affected by the context of a conversation. Previous studies have concentrated on either the subjective effects of conversation or the neurobiological effects of oxytocin. The studies on the subjective impacts of conversation conditions looked at how different types of talk affected people's feelings about themselves and their partners (e.g., better mood, higher kindness) (Aron et al., 1997). Studies of oxytocin's neurobiological impacts, on the other hand, assessed oxytocin levels in situations where there was no discussion (e.g., sympathetic scenarios) or in cases where there were romantic partners (Procyshyn et al., 2020). Both sorts of studies ignored the impact of the other, necessitating the need for research like the one being conducted through this study.

Researchers have devised ways to study conversations in a controlled laboratory environment (Aron et al., 1997; Sprecher & Treger, 2015). During experiments, the settings were separated into small talk and deep conversation. Following a 45-minute conversation, participants reported feeling more closeness in the deep conversation environment (Aron et al., 1997). The Aron et al (1997) study paired participants for conversation based on sex, attachment style, and agreement on key subjects. The ability to adapt the findings to a normative population is hampered by the highly controlled nature of the pairing methods utilized in the Aron et al. (1997) study. The current study extended the results to partners not specifically matched on attachment style or agreement on key topics.

This study investigated how small talk and deep conversations affect connectedness and mood using self-report measures. Further, this study investigated the difference between small talk and deep conversations on oxytocin levels using salivary oxytocin. This study used a within-subject design in which each participant attended two in-person audio-recorded sessions. During one session, they conversed with another participant following a semi-structured script that involved ‘small talk’ (e.g., topics that one might share with a stranger). During the other session, they conversed with a different partner, and the script involved deeper topics (such as those one might share with a close friend). Participants were paired with a different same-sex participant during each session. The primary outcome measures were oxytocin levels and the level of overall mood and connection between subjects (See Appendix). The research team of this study hypothesized that deep conversations would lead to higher levels of connection and positive mood. It was also hypothesized that deep conversations would increase oxytocin levels more than small talk since oxytocin has been found to relate to feelings of trust.

Methods

Subjects

Healthy men (*n*=19) and women (*n*=18), aged 18-35, were recruited using flyers around the University of Chicago campus and through online advertisements. Exclusion criteria were less than a high school diploma, lack of fluency in English, or recent severe psychiatric symptoms. Psychiatric symptoms were assessed using the Symptom Checklist-90-R, which evaluates psychological symptoms of nine psychological disorders (somatization, obsessive-compulsive disorder, interpersonal sensitivity, depression, anxiety, hostility, phobic anxiety, paranoid ideation, psychoticism; Derogatis & Savitz, 1999).

Procedure

At an orientation session before the first session, subjects provided information about their use of cannabis, alcohol, ecstasy, and tobacco. Subjects provided informed consent before the study. They were instructed to abstain from alcohol twenty-four hours prior to the sessions and cannabis at least seventy-two hours prior to their sessions. Subjects were also asked to abstain from food an hour prior to their sessions to minimize contamination of the saliva samples. Due to the COVID-19 pandemic, participants were given the choice of removing their masks based on comfortability. All participants had received a COVID-19 vaccine by the time of participation.

The two study sessions were each two hours in length and conducted between 11:00 am and 5:00 pm. Upon arrival, participants provided urine samples for drug testing, breath samples for verification of alcohol abstinence and a saliva sample for oxytocin levels. They completed the Positive and Negative Affect Schedule (PANAS; Watson et al., 1988) before and after

engaging in the assigned conversation. On both sessions subjects engaged in a 45-min semi-structured conversation with a same-sex partner. The subjects always had a different partner for the two sessions. In the recorded conversation, subjects were given topics to discuss on a sheet of paper. They were given 12 possible topics for each of the three 15 min segments and were alerted that 15 minutes had passed by the experimenter. On one of the sessions all three sets of topics were considered to be 'small talk' and included fairly impersonal topics (Aron et al., 1992). During the other session, the sets of topics in the three segments were progressively 'deeper', from small talk to more substantive questions (Aron et al., 1992). Subjects were instructed to engage in a natural conversation, with these topics, and they were free to not discuss a topic if they preferred. Their conversations were audiotaped. Ten minutes after the conversation, the participants provided a second saliva sample and completed questionnaires assessing their mood and feelings of connectedness with their partner (see below). Up to a week after the second session participants had a follow-up session where they completed additional questionnaires assessing their experiences with the two conversations, and the experimenter explained the purpose of the study.

Measures of Mood and Connection

The participants completed the Positive and Negative Affect Schedule questionnaire before and after each session (PANAS; Watson et al., 1988). This questionnaire measures positive and negative moods by providing the participants with 10 positive emotions (e.g. excited, proud) and 10 negative emotions (e.g. irritable, hostile).

Questionnaires administered immediately following each session included three questionnaires. First, they completed the Better-Up Conversation Items questionnaire, which is a six-question survey that examines the intensity of the connection, ranging from "Not at all" (0) to

"Extremely" (100) (See Appendix). The second questionnaire was the Liking Partner questionnaire (Miller et al., 1983), which consists of 3 questions regarding the likability of the partner, ranging from "dislike" (0) to "a great deal" (9). The last questionnaire was the Social Interaction and Connection questionnaire (Okabe-Miyamoto et al., 2020). The Social Interaction and Connection is a 16-item questionnaire that assesses social connection. The 16 items are separated into negative and positive statements.

Questionnaires were also administered up to a week after the two sessions during the follow-up session. This was done to test if time affects the feelings of the partners about each other. During the follow-up, the subjects completed the Better-Up Items questionnaire, the Liking Partner questionnaire and the Social Interaction and Connection questionnaire for each of their partners. The subjects also completed the Features of Connection with Partner – Self-Other-Overlap (Aron, et al. 1992). This measure assesses the connection felt with each partner. It consists of 7 pairs of circles with varying degrees of overlap, ranging from "no overlap" (A; no connection) to "most overlap" (G; felt connected).

Data Analysis

All statistical analyses were conducted using Microsoft Excel and SPSS (Statistical Package for the Social Sciences (Version 28). An alpha level of 0.05 was used to determine significance of the results.

Mood before and after conversation

To identify the effect of the condition of a conversation on the mood of participants measured by the PANAS questionnaire, a two-way ANOVA test was utilized. The main effect of

time (pre- and post-conversation), main effect of condition (small or deep conversation), and time and condition interaction were analyzed separately for both positive and negative mood.

End of session questionnaires

For an examination of the effect of social interaction on subjective experience, within-subject *t*-tests were performed. Questionnaires filled out following conversations (Liking Partner, Better-Up, Social Interaction and Connection) were analyzed using *t*-tests. Paired-samples t-tests were conducted to compare responses in the two conversation conditions.

Follow-up questionnaires

An assessment similar to the one used for the end of session questionnaires was used for the follow-up questionnaires (Liking Partner, Better-Up, Social Interaction and Connection, Self-Other Overlap).

Saliva Samples

The saliva was collected using a passive drool method. The oxytocin was assayed using a commercial kit (Salimetrics Salivary Assay) kit (Salimetrics, Carlsbad, CA). Following collection, the samples were stored in -80° C until processing. Samples were shipped to Assay Services Core Lab (Wisconsin National Primate Research Center, Madison, WI) for processing. The lower level of detection for oxytocin was 0.313 pg/mL.

Analysis of the oxytocin samples was performed using a two-way ANOVA test. The factors analyzed were the conversation condition: small talk and deep conversations, as well as the timepoint: pre-session and post session.

Results

Demographics

The majority of the participants were Caucasian (70.3 %) and in their mid-twenties (23.5 ± 3.37, Table 1). Most participants were weekly alcohol drinkers with an average of 4 drinks a week (4 ± 4.38), and only two of the participants were smokers. The average length of time between the first session and the second session was 16.5 days, while the average length of time between the last session and the follow-up session was 5.3 days.

Table 1.

Demographics Table

Category	*n* or Mean ± SD Range
Subjects (Male/Female)	37 (19/18)
Age, Years	23.85 ± 3.37
Education, Years	15.62 ± 1.82 (14-20)
Race	
Caucasian	26
African American	2
Asian	5
Other/>1 Race	4
Current Drug use in Past Month	
Cannabis, times/Week (*n*=6)	4.17 ± 2.86
Alcohol, Drink/Week(*n*=23)	4 ± 4.38
Alcohol, Drinking days/week(*n*=22)	1.82 ± 1.01
Tobacco, times/day (*n*=2)	12.5 ± 3.54
Total Lifetime Drug Use, Nonmedical	
MDMA/ Molly (*n*=8)	8.75 ± 12.34

Note: n = number of participants who used the substance. Mean = mean of amount of usage for all participants who used the substance.

PANAS

There was a main effect of timepoint on overall mood ($F(1, 36) = 23.81$, $p =<0.001$); positive mood increased while negative mood decreased from pre-conversation to post-conversation. However, there was no main effect of condition on overall mood ($F(1, 36) = 2.42$, $p = 0.13$); positive and negative mood did not change between small talk and deep conversation. Further, there was no main effect of the interaction between timepoint and condition on overall mood ($F(1, 36) = 0.22$, $p= 0.64$); the interaction between the two factors (timepoint and condition) did not change the overall mood.

Table 2.

Measurement Subjective Effect (Pre and Post Session)

Measurement	Positive Moods Mean ± SD	Negative Moods Mean ± SD
PANAS		
Deep conversation		
Pre-Talk	30.59 ± 7.48	14.84 ± 3.63
Post-Talk	32.46 ± 7.88	12.96 ± 2.93
Small Talk		
Pre-Talk	30.12 ± 7.23	13.91 ± 3.49
Post-Talk	31.07 ± 9.02	12.33 ± 2.6

Note: PANAS (Watson et al., 1988)

Post Session Questionnaires

For the post session questionnaires, we analyzed each individual question using a paired sample *t*-test. Due to the large number of t-tests included, a correction for multiple comparisons was conducted for each questionnaire using the Bonferroni correction method.

First, we analyzed the questions given following the sessions, starting with The Better-Up Items questionnaire. Following the Bonferroni correction, the corrected *p* value was 0.008. Participants reported that the deep conversation was significantly more meaningful than the small talk conversation. Further, participants felt that they had significantly more in common with their deep conversation partner than the small talk partner. Participants also felt closer to the deep conversation partner (Table 3).

Second, we analyzed the Liking Partner questionnaire. Following the Bonferroni correction, the corrected *p* value became 0.02. The participant's responses revealed that they would rather have their deep conversation partner as a close friend more than their small talk partner. However, participants did not score significantly higher when asked if they liked their deep conversation partner more than their small talk partner or if they would like to see the deep conversation partner more than their small talk partner (Table 3).

Next, we analyzed data from the Social Interaction and Connection questionnaire. Following the Bonferroni correction, the corrected *p* value for positive statements became 0.005 and 0.008 for negative statements. Five of the ten positive statements were scored significantly higher in deep conversation than small talk (Table 3). Next, participants were presented with negative statements about their conversation and partner. One of the six questions had a significantly lower score in deep conversation compared to small talk (Table 3).

Table.3

Measurement of Subjective Effect (Post Session)

Measurement	Small Talk Mean ± SD	Deep conversation Mean ± SD	*P*
Better-Up Items			
How enjoyable did you find the conversation?	6.58 ± 2.02	7.32 ± 1.37	0.053
How meaningful did you find the conversation?	4.74 ± 2.21	6.56 ± 1.88	0.00004*

How much did you like your conversation partner?	6.59 ± 1.85	7.5 ± 1.05	0.013
How much did you think your conversation partner liked you?	5.92 ± 1.38	6.53 ± 1.36	0.028
How much did you and your partner have in common with one another?	5.16 ± 1.9	6.44 ± 1.04	0.0005*
How close did you feel to your conversation partner?	4.53 ± 2.07	5.72 ± 1.74	0.0075*
Liking Partner Questionnaire			
How much do you like your partner?	8 ± 1.91	8.73 ± 1.37	0.08
How much would you like your partner as a close friend?	6.19 ± 2.27	7.19 ± 1.98	0.01*
How much would you like to see your partner again?	6.78 ± 2.33	7.62 ± 1.98	0.048
Social Interaction and Connection			
Positive Statements			
I felt "in sync" with them	5.11 ± 1.41	5.81 ± 0.97	0.02
I felt like we shared a lot in common	4.54 ± 1.48	5.62 ± 1.04	0.001*
I felt that we saw the world in the same way	4.46 ± 1.35	5.27 ± 1.28	0.004*
They were able to relate to my experiences	4.84 ± 1.48	6 ± 0.88	0.0001*
They were interested in my thoughts and feelings	5.62 ± 1.32	6.05 ± 0.81	0.11
They really understood who I am	3.89 ± 1.45	4.76 ± 1.5	0.009
I felt that they cared about me	4.3 ± 1.22	5 ± 1.27	0.009
They respected my beliefs and opinions	5.92 ± 1.16	6.35 ± 0.72	0.04*
I was interested in their thought and feelings	5.76 ± 1.28	6.27 ± 0.73	0.03*
I was truly attentive during the interaction	5.81 ± 1.1	6.24 ± 1.04	0.07
Negative Statements			
I thought they were boring	2.22 ± 1.38	1.7 ± 0.78	0.04*
I was distracted during the conversation	2.11 ± 1.17	1.89 ± 1.22	0.3
I felt that it was hard to communicate with them	2.03 ± 1.48	1.76 ± 1.16	0.4
I couldn't wait for the interaction to end	2.05 ± 1.31	1.68 ± 1	0.14
I felt that my energy was drained by the interaction	2.49 ± 1.74	2.43 ± 1.64	0.89
I was nervous during the interaction	2.35 ± 1.44	2.57 ± 1.54	0.4

Note: Better-Up Items Questionnaire (See Appendix); Liking Partner (Miller et al., 1983); Social Interaction and Connection (Okabe-Miyamoto, 2020); Following a correction of comparisons using Bonferroni, the Better-Up questionnaire p= 0.008. The Liking Partner questionnaire's p= 0.02. The Social Interaction and Connection p=0.005 for positive statements, p=0.008 for negative statements.

Follow-Up Questionnaires

For the Better-Up Items questionnaire, participants reported higher scores of meaningfulness during the deep conversation. Participants also reported that they liked their

deep conversation partners and believed their deep conversation partners liked them more than their small talk partners. Similar to their responses after the sessions, participants reported that they felt closer to their deep conversation partner, and that they had more in common with their deep conversation partner. Similar to the post-session questionnaire results, participants did not report significantly higher on the enjoyment of the deep conversation (Table 4).

For the Liking Partner questionnaire, participants reported that they liked their deep partner significantly more than their small talk partner. Participants also preferred to have their deep conversation partner as a close friend. Lastly, participants reported higher scores when asked which partner they would like to see again (Table 4).

In the Social Interaction and Connection analysis, positive statements showed a change compared to the post session responses. Contrary to the post-session responses, three of the five positive statements that showed a significance in the post-session responses showed no significant difference between deep conversation and small talk in the follow-up analysis. Further, contrary to the post-session responses, none of the six negative statements had a significant difference between the two conversation conditions (Table 4).

Self-Other Overlap

Finally, the self-other overlap assessment showed significantly higher rates of closeness in deep conversation compared to small talk (Table 4). Men and women did not differ in their ratings of closeness during small talk ($t(35)=1.65$, $p= 0.11$) or deep conversation ($t(35)=-1.42$, $p= 0.16$).

Table.4

Measurement of Subjective Effect (Follow-Up)

Measurement	Small Talk	Deep conversation	*P*

	Mean ± SD	Mean ± SD	
Better-Up Items Questionnaire			
How enjoyable did you find the conversation?	5.89 ± 1.8	6.85 ± 1.18	0.008
How meaningful did you find the conversation?	4.99 ± 1.9	6.64 ± 1.45	0.0002*
How much did you like your conversation partner?	5.92 ± 1.67	6.93 ± 1.24	0.003*
How much did you think your conversation partner liked you?	5.57 ± 1.31	6.34 ± 1.29	0.002*
How much did you and your partner have in common with one another?	5.09 ± 1.69	6.16 ± 1.46	0.005*
How close did you feel to your conversation partner?	4.53 ± 1.95	5.94 ± 1.6	0.001*
Liking Partner Questionnaire			
How much do you like your partner?	6.97 ± 1.89	8 ± 1.35	0.008*
How much would you like your partner as a close friend?	5.57 ± 2.05	6.68 ± 2.04	0.005*
How much would you like to see your partner again?	5.59 ± 2.23	7 ± 2.12	0.0007*
Social Interaction and Connection			
Positive Statements			
I felt "in sync" with them	4.81 ± 1.41	5.43 ± 1.19	0.07
I felt like we shared a lot in common	4.41 ± 1.48	5.32 ± 1.23	0.01
I felt that we saw the world in the same way	4.43 ± 1.28	5.3 ± 1.18	0.001*
They were able to relate to my experiences	4.84 ± 1.36	5.6 ± 0.95	0.013
They were interested in my thoughts and feelings	5.38 ± 1.16	5.84 ± 0.93	0.07
They really understood who I am	3.81 ± 1.51	4.78 ± 1.34	0.003*
I felt that they cared about me	4.54 ± 1.24	5.03 ± 1.24	0.034
They respected my beliefs and opinions	5.73 ± 1.04	6.08 ± 0.8	0.06
I was interested in their thought and feelings	5.43 ± 1.17	5.89 ± 0.91	0.04
I was truly attentive during the interaction	5.43 ± 1.24	5.76 ± 1.11	0.26
Negative Statements			
I thought they were boring	2.59 ± 1.32	2.13 ± 1.25	0.12
I was distracted during the conversation	2.46 ± 1.37	2 ± 1.06	0.09
I felt that it was hard to communicate with them	2.81 ± 1.65	1.95 ± 1.22	0.02
I couldn't wait for the interaction to end	2.54 ± 1.63	2.19 ± 2.54	0.23
I felt that my energy was drained by the interaction	2.62 ± 1.69	2.46 ± 1.5	0.62
I was nervous during the interaction	2.43 ± 1.28	2.7 ± 1.51	0.27
Self-Other Overlap	3.24 ± 1.4	4.38 ± 1.46	0.001

Note: Better-Up Items Questionnaire (See Appendix); Liking Partner (Miller et al., 1983); Social Interaction and Connection (Okabe-Miyamoto, 2020); Self-other overlap (Aron et al.., 1997). Following a correction of comparisons using Bonferroni, the Better-Up questionnaire p= 0.008. The Liking Partner questionnaire's p= 0.02. The Social Interaction and Connection p=0.005 for positive statements, p=0.008 for negative statements.

Oxytocin Assays

The oxytocin levels in the saliva samples were below the limit of detection in most samples. Five participants had detectable oxytocin levels in pre and post-sessions for both conversations, while 11 participants had detectable oxytocin levels for their post-session samples but not for their pre-session samples for both conversations. An analysis was performed for the five participants with detectable levels of oxytocin.

An evaluation of all the samples with detectable levels of oxytocin (n = 5) was conducted using a two-way ANOVA analysis. There was no main effect of timepoint on oxytocin levels ($F(1, 36) = 1.088$, $p = 0.356$). Further, there was no main effect of condition on oxytocin levels ($F(1, 36) = 7.772$, $p = 0.05$). Lastly, there was no main effect of interaction between timepoint and condition on oxytocin levels ($F(1, 36) = 0.570$, $p = 0.492$).

Table 5.

Measurement Oxytocin Levels (Pre and Post Session)

Measurement	Oxytocin Levels Mean ± SD
Saliva Samples (n = 5)	
Deep conversation	
Pre-Talk	0.54 ± 0.16
Post-Talk	0.56 ± 0.156
Small Talk	
Pre-Talk	0.61 ± 0.2
Post-Talk	0.68 ± 0.12

Note: The analysis presents data of the 5 participants with detectable levels of oxytocin. The second analysis presents data of the participants with detectable levels of oxytocin in the post-sessions but not the pre-session. The third analysis presents data of all of the participants in the study.

Discussion

The current study aimed to explore the effects of two different social interaction conditions on feelings of social connection and oxytocin levels. Using a within-subject design, the study investigated two conversation conditions (deep conversation and small talk). We measured subjective effects using questionnaires given at the end of the sessions, and during the follow-up session. We measured salivary oxytocin levels before and after each conversation. However, due to collection issues, the oxytocin results were not interpretable. The results of the subjective effect measurements supported our hypothesis that deep conversation yielded higher ratings of closeness and connection compared to small talk.

Self-reported Effects

The conversations significantly impacted participants' mood. Regardless of conversation condition (deep vs. small), conversations not only increased positive mood ratings, but also decreased negative mood ratings. Deep conversations did not significantly impact mood more than small talk. This suggests that conversations influence mood in a manner that is not strongly dependent on the conversation condition (deep vs. small). These results differ slightly from a prior study investigating the impact of conversations on feelings of happiness. Kardas et al. (2022) reported that happiness increased more after deep conversations when compared to small talk. This suggests that changes in positive and negative mood are not directly related to feelings of happiness. Ultimately, conversations can impact mood and happiness in different ways and the type of conversation may impact happiness more than mood states.

Findings of our study replicate and support an increase in short-term well-being following both conversations. Previous research reported an increase in short-term well-being in deep conversation when compared to small talk (Mehl et al., 2010). It is important to note, the

Mehl et al. (2010) study defined deep conversations as those where more time was spent in conversation, in addition to the content of the conversation. This was not the case in the present study. We defined deep conversation based only on the content of the conversation, and found both deep conversation and small talk led to short-term increases in well-being. Overall, past and present findings suggest conversations can result in short-term increases in well-being that is not strongly dependent on the type of conversation.

Deep conversations increased feelings of closeness more than small talk. The subjective effects measured with the post-session questionnaires (Better-Up items, the Liking Partner, Social Interaction, and Connection), were significantly different between the two conditions. The results showed that deep conversations allowed participants to explore conversations in a meaningful way. Such results confirm the findings of previous studies that found that deep conversations produce higher feelings of closeness and connectedness compared to small talk (Aron et. al, 1997; Kardas et. al, 2022). In the Kardas et al. (2022) study, participants underestimated how connected they would feel to their partner in each condition. They were, nevertheless, more bonded to their deep conversation partner. This is in line with our findings, which showed that while both small talk and deep conversations increased emotions of intimacy, deep conversations increased overall sentiments of closeness.

Elevated feelings of connectedness during deep conversation could aid in reducing symptoms of depression. A previous study that trained people to have better conversational skills (deep conversations) reduced feelings of depression and allowed participants to feel more sociable (Mote et al., 2021). However, the results from the Mote et al. (2021) study did not investigate small talk. Deep conversations, in our study, elicited sensations similar to those experienced by participants of events that teach such skills. Our participants felt "in sync" with

their partners during deep conversations, implying a rise in connectedness. Our findings also showed that small talk increases feelings of connectedness but not to the extent generated by deep conversations. It could be that small talk also aids in reducing symptoms of depression; but it had not been previously explored. The impact of the two conversation conditions on depression and other mental illnesses could be a promising research topic for future studies.

The duration of a conversation, as well as the nature of the conversation, affects how much participants would like their partner as a friend. Boothby et al. (2018) explored the "liking gap" which measures the effect of time on the underestimation of liking from others. The study found that the longer the conversation, the more participants felt liked by their partners. This suggests that the length of the conversation affects feelings of liking among individuals. This was accounted for during our study, as participants in both conditions had the same amount of time to converse. One of the questions asked in our study was *"How much would you like your partner as a close friend?"* (Miller et al., 1983). The question was used for measurement of liking and showed a significantly higher score during deep conversations compared to small talk. This suggests that feelings of liking between two individuals are affected by the content of the conversation, as well as, the length of the conversation.

Oxytocin Assays

Due to the limitations with data collection and analyses, precise conclusions were underpowered to detect any effect of condition or timepoint on oxytocin levels. In the analysis of the 5 subjects with adequate oxytocin levels, we saw a slight increase in oxytocin after both conversation conditions. However, samples were not powerful enough to detect significance. No inferences could be made, but this points in the direction that both small talk and deep conversations affect oxytocin levels. Previous research has indicated that deep conversations,

which necessitate the development of trust and the exchange of personal information such as gossip, boost oxytocin levels (Brondino et al., 2017). The Brondino et al. (2017) study supports the effect of conversation condition on oxytocin levels although that was not found in our study due to multiple aforementioned limitations.

Previous studies have found a connection between trust and oxytocin among individuals (Kosfeld et al., 2005). It could be suggested that small talk as well as deep conversation require trust. In our study, both conditions had the same length, allowing for the development of trust among partners. Participants in this study were not asked about trust levels; thus, we are unaware of any trust changes between the participants. This theory would necessitate greater investigation and a different design; yet this would be an intriguing topic for future research.

Limitations

The study had several limitations. First, the oxytocin assays were not available to address one of the study questions. We can assume from previous studies that oxytocin facilitates connection (Brondino et al., 2017; Brockington et al., 2021). However, this study could not highlight the neurological underpinnings of connection. Second, the subjective effects of the conversation were, on average, rated only one week after the second conversation, and we did not follow up on the relationship development between partners. Thus, we do not know how long the reported effects of the experience lasted, and whether they affected other aspects of participants' lives. Third, our sample size was not large enough to examine possible individual differences in this effect, such as differences related to personality variables.

Strengths and Future Directions

The design of this study provides multiple advantages. First, participants were all randomly paired; this means that any connections made during the sessions were not due to any previous relationship or personality parallels. In contrast to other studies such as Aron et al. (1997), participants were not matched with partners based on shared characteristics other than sex. This allows for the results of this study to be generalized as they depend on random pairing. Second, all of the participants were given the same amount of time to converse and were placed in the same room, allowing time and place to be controlled variables in this study. Future studies can further research in this field by exploring the difference in effects of deep conversations and small talk. Such effects include subjective effects such as stress levels and neurobiological effects such as levels of cortisol. Future research could also allow someone to observe individuals filling out saliva samples to avoid having poor sample quality. Although salivary oxytocin was employed in this study due to its importance in prior investigations, such as Brondino et al. (2017), future studies could choose to assess oxytocin in plasma.

Conclusion

The study found that engaging in a 45 min conversation with ‘deep’ topics produced greater feelings of connectedness with the partner and increased the meaningfulness of the conversation compared to a conversation with more shallow topics. Findings of this study validated the results of previous research that investigated the subjective effects of different conversation conditions. Although no significant change in oxytocin levels was found between the two social conditions, the ratings and conclusions of this study could be used in future replication studies.

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APPENDIX

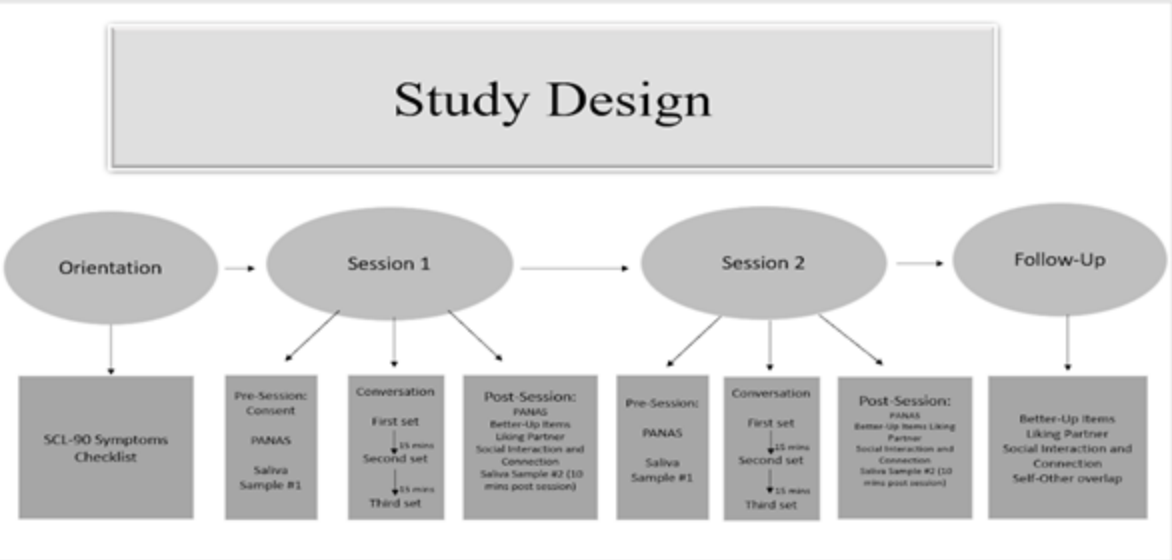
Instructions

Thank you both for coming. I will now give you your first set of questions to ask each other. Please take turns asking each other at your own pace. Take as much time as needed to answer any given question. You may choose to decline to answer a question but make sure both yourself and your partner do not answer that question. I will give you three sets of questions; I will come in every 15 minutes to give you a new set, for a total of 45-minutes.

Better-Up Items Questionnaire

Please reflect on the conversation that you just had and answer the following questions about your conversation partner. The Scale: Not at all (0) à Extremely (9)

1) How enjoyable did you find the conversation?
2) How meaningful did you find the conversation?
3) How much did you like your conversation partner?
4) How much did you think your conversation partner liked you?
5) How much did you and your partner have in common with one another?
6) How close did you feel to your conversation partner?


Study Design
Orientation
Session 1
Session 2
Follow-Up
SCL-90 Symptoms Checklist
Pre-Session: Consent
PANAS
Saliva Sample #1
Conversation
First set
15 mins
Second set
15 mins
Third set
Post-Session:
PANAS
Better-Up Items
Liking Partner
Social Interaction and Connection
Saliva Sample #2 (10 mins post session)
Pre-Session:
PANAS
Saliva Sample #1
Conversation
First set
15 mins
Second set
15 mins
Third set
Post-Session:
PANAS
Better-Up Items Liking Partner
Social Interaction and Connection
Saliva Sample #2 (10 mins post session)
Better-Up Items
Liking Partner
Social Interaction and Connection
Self-Other overlap